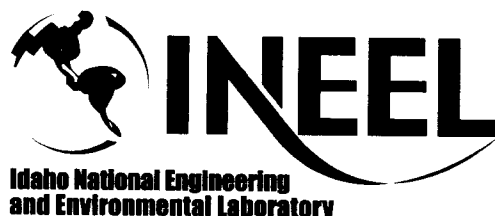


Specification

[PROJECT FILE NO. 021052]

Backhoe Modifications – Backhoe Flow Restrictions for the OU 7-10 Glovebox Excavator Method Project

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho



Form 412.14
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Rev. 03

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1. SUMMARY

1.1 General

The Idaho National Engineering and Environmental Laboratory (INEEL), a Department of Energy national laboratory operated by Bechtel BWXT Idaho, LLC, will procure a Backhoe Excavation System. The Backhoe Excavation System incorporates a modified CAT 446B backhoe loader and associated end effectors. The backhoe loader will be the primary instrument used in the retrieval of radioactively contaminated waste in the Operable Unit (OU) 7-10 Glovebox Excavator Method Project.

The OU 7-10 Glovebox Excavator Method Project incorporates the Retrieval Confinement Structure (RCS) located over the excavation site. The RCS consists of a steel-framed, steel-paneled structure with Lexan windows. The confinement structure is located within a larger fabric-skinned Weather Enclosure Structure. Packaging Glovebox Systems are attached directly to the RCS and are fed by track-guided transfer carts.

A standard 446B backhoe performs soil excavation, probe removal, 55-gal drum removal (using a jaw bucket design), and core sampling (using a jackhammer/core sampler design). The backhoe cab and loader are located outside the RCS, while the boom, stick, and various end effectors are located inside the contaminated RCS structure (see Figure 1).

Maintaining a slow, gradual movement of the boom and stick within the RCS is of paramount concern. It is desirable to decrease speed at which the boom is lowered and raised. If the backhoe bucket were positioned above or below the transfer cart frame, a sudden vertical movement of the boom could be catastrophic. Additionally, the hydraulic lines run a risk of becoming snagged and dislodged on the upright probes when digging around ground probes. Decreasing the velocity at which the boom can be lowered decreases the risk of inadvertently rupturing a hydraulic line on a ground probe. Decreasing the speed at which the stick can be lowered and raised also decreases the risk of the previously mentioned accident scenarios. Reducing the speed at which the extendable stick is extended and contracted is not necessary due to its inherent slow speed of travel.

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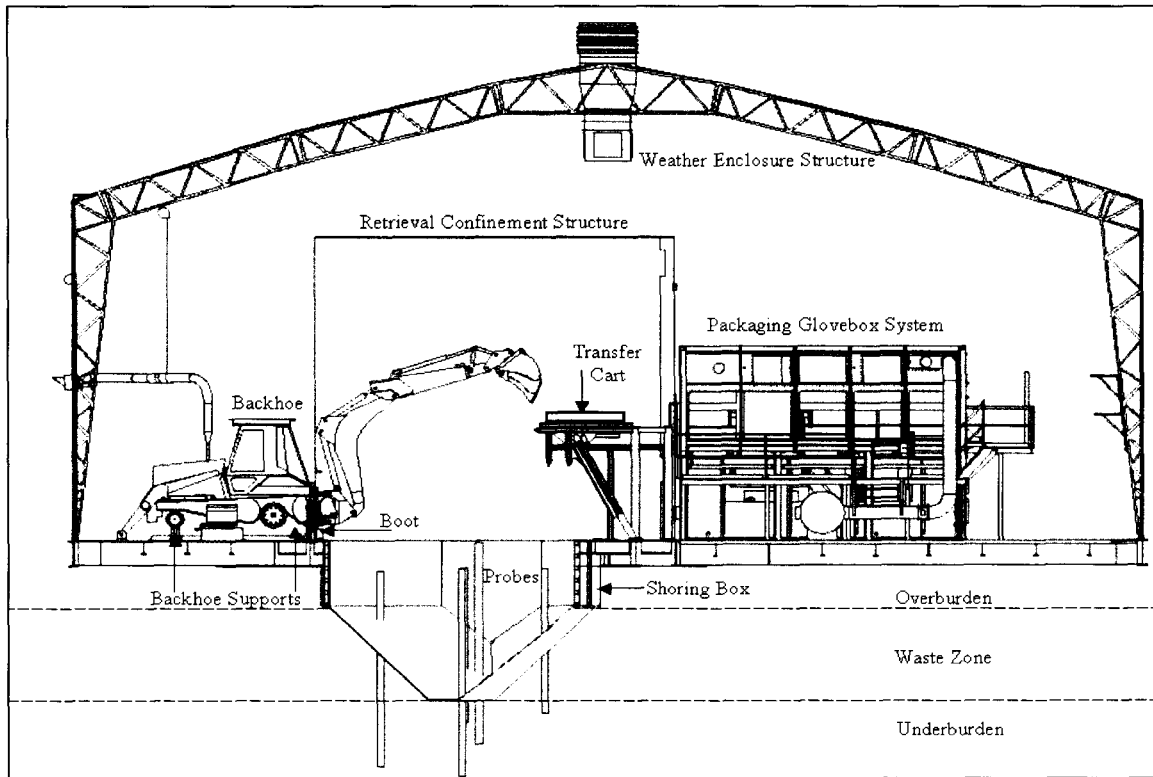


Figure 1. Cross section of the Glovebox Excavator Method Project facility.

Reducing the speed at which the boom can swing the full 180 degrees (right and left) is also of high concern. Excavation of the pit around ground probes requires a high degree of finesse. Reducing the boom swing speed decreases the risk of inadvertently impacting a probe with the side of the bucket. Additionally, reducing the boom swing speed reduces the risk of impacting a transfer cart frame, the gloveport station within the RCS wall to the left of the operator, and the RCS wall to the right of the operator.

While it is imperative to reduce the boom and stick speed, it is equally as imperative to maintain a rapid bucket uncurl speed. The bucket will be used in the excavation of various types of sludge. It may become necessary to rapidly uncurl the bucket over a transfer cart in an effort to release high-viscosity sludge from the bucket. Although the bucket uncurl speed shall be left unmodified, the bucket curl speed shall be reduced to provide a higher degree of bucket dexterity and to prevent the weight of the combined jaw bucket/coupler from pushing the return hydraulic fluid (from the bucket curl cylinder) back to the tank faster than the pump can supply fluid to the bucket curl cylinder.

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Reduction of the hydraulic fluid flow to and from the backhoe auxiliary lines is necessary due to the H45S hydraulic hammer having an acceptable hydraulic fluid flow of 5 to 13 gal/min and the jaw bucket having an acceptable hydraulic fluid flow of 15 to 20 gal/min. By limiting the auxiliary hydraulic flow rate between 14.5 and 15 gal/min, the jaw bucket opens/closes at a slower rate and the hammer operates at a slightly faster rate.

Physical stops within the valve body, referred to as C.V. shims in this specification, shall be placed within the stabilizer valve bodies to limit hydraulic fluid flow to the auxiliary lines and swing cylinders. The C.V. shims limit the spool travel within the valve body, thereby restricting the hydraulic fluid flow while maintaining full system pressure. By reducing the hydraulic fluid flow to the auxiliary lines and swing cylinders, the cycle times (time required to fully extend or retract the appropriate cylinder) are increased. Hence, the swing cylinder travel speed is reduced to a specified cycle time, and the jaw bucket and hammer flow rates are reduced to within the operating parameters.

Lock check valves, discussed in another specification within this specification package, are placed within the boom, stick, and bucket curl hydraulic lines. These check valves have the capability of reducing the hydraulic flow to within specified parameters. To reduce the speed of the boom, stick, and bucket curl, the locking check valves shall be adjusted to provide the appropriate flows and cycle times.

1.2 Work Included

This specification covers the subcontractor and equipment supplier's requirements for design, fabrication, assembly, installation, and testing. It is not the intent of this specification to completely define all details of installation. Equipment shall be designed, fabricated, assembled, and installed in accordance with this specification and the equipment supplier and subcontractor's standard practices when such practices do not conflict with this specification.

The C.V. shims, and all associated hardware, shall be completely assembled and installed into the 446B backhoe at the subcontractor's facility.

The following shall be delivered to Bechtel BWXT Idaho, LLC:

1. A complete and fully integrated system of the C.V. shims within the swing valve on the stabilizer valve group to provide hydraulic fluid flow and cycle times, as shown on Table 1 and Contract Drawing 519931.

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2. A complete and fully integrated system of the C.V. shims within the auxiliary valve on the stabilizer valve group to provide hydraulic fluid flow, as shown on Table 1 and Contract Drawing 519931.
3. Calibration of the stick cylinder lock check valve to provide hydraulic fluid flow and cycle times, as shown on Table 1 and Contract Drawing 519931.
4. Calibration of the boom cylinder lock check valve to provide hydraulic fluid flow and cycle times, as shown on Table 1 and Contract Drawing 519931.
5. Calibration of the bucket curl cylinder lock check valve to provide hydraulic fluid flow and cycle times, as shown on Table 1 and Contract Drawing 519931.
6. Vendor data submittals in accordance with vendor data schedule and this specification.

Table 1. Maximum allowable speed with C.V. shims in place.

Backhoe Movement	Hydraulic Fluid Flow Rate (gallons per minute)	Cycle Time (seconds)
Boom lift (ground-to-stop)	11.5–12.5	5–5.5
Stick full curl (stop-to-stop)	14.5–15.5	10–10.5
Bucket uncurl (stop-to-stop)	16.25–17.25	2.5–3.5
Auxiliary valve	14.5–15	—
Boom swing (stop-to-snubber: approximately 180°)	8.5–9.5	7–7.5

1.3 Work Not Included

Not applicable

1.4 INEEL-Furnished Materials, Equipment, and Services

The INEEL will furnish the 446B backhoe loader.

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2. APPLICABLE CODES, PROCEDURES, AND REFERENCES

The following documents form a part of this specification to the extent specified herein and as applicable. Unless otherwise specified, the issue in effect on the date of invitation to bid shall apply. In case of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

2.1 National and Local Codes

Occupational Safety and Health Administration

29 CFR 1910, Occupational Safety and Health Standards

2.2 Industry Standards and Department of Energy Orders

Not applicable.

2.3 Military (National) Specification

Not applicable.

2.4 Related Specifications

Not applicable.

2.5 References

Not applicable.

3. TECHNICAL REQUIREMENTS

3.1 General

The C.V. shims shall be designed by the equipment supplier and installed by the subcontractor to provide for a fully functional system and to perform as specified and in a safe and efficient manner.

The locking check valves shall be adjusted by the subcontractor to provide for a fully functional system and to perform as specified and in a safe and efficient manner.

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3.2 Restrictions

None identified.

3.3 Performance Requirements

See Table 1.

3.4 Software

Not applicable.

3.5 Registered Professional Engineer Certification

Not applicable.

3.6 Human Factors

Not applicable.

3.7 Reliability and Maintainability

3.7.1 Reliability

All subcomponents of the C.V. shims shall be of a quality that the expected mean time between failures for this system shall not be less than 1,080 hours.

The C.V. shims shall employ rugged, industrial off-the-shelf equipment to the maximum extent practical.

3.7.2 Maintainability

None identified.

3.8 Environmental Regulatory Requirements and/or Site and Operating Requirements

Not applicable.

3.9 Natural Phenomena Requirements

Not applicable.

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4. ENVIRONMENTAL, SAFETY, AND HEALTH REQUIREMENTS

4.1 Subcontractor Safety

The subcontractor shall work in accordance with applicable Occupational Safety and Health Administration requirements, as stated in 29 CFR 1910.

4.2 Personal Protective Equipment

The subcontractor shall determine and require use of appropriate personal protective equipment for all tasks performed.

4.3 Emergency Response

Not applicable.

4.4 Accident Investigation

Not applicable.

5. MANUFACTURING AND ASSEMBLY

5.1 General

The C.V. shims shall be assembled and installed within the backhoe and stabilizer control valves on a 446B backhoe, in the subcontractor's shop, to ensure proper fits and operation. The contractor's technical representative or alternate will inspect the speed of the assembled final product.

5.2 Prohibitions

None identified.

5.3 Material

Materials used shall be free from defects that would adversely affect the performance or maintainability of individual components or the overall assembly.

5.4 Fabrication

Not applicable.

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5.5 Equipment Tagging

Not applicable.

5.6 Cleaning, Painting, and Coating

Not applicable.

5.7 Spare Parts

Cross-reference the applicable standard quality requirements identified in the procurement package.

5.8 Other Processes

Not applicable.

6. SUBMITTALS

As a minimum, the subcontractor shall provide the contractor with the submittals referenced in this section. The subcontractor shall be responsible for all submittals that come from the equipment supplier. Additional submittal requirements are defined in the vendor data schedule and applicable contract documents. The quantities and submittal schedule are included in the attached vendor data schedule.

6.1 General Submittal Requirements

6.1.1 General Procedures

Vendor data, whether prepared by the subcontractor or subcontractor's subtier or supplier, shall be submitted as instruments of the subcontractor. Therefore, prior to submittal, the subcontractor shall ascertain that material and equipment covered by the submittal and the contents of the submittal itself, meet all the requirements of the subcontract specifications.

Each submittal shall contain identification for each separable and separate piece of material or equipment and literature with respect to the information provided in the specification and on the vendor data schedule. Submittals shall be numbered consecutively for each different submittal.

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6.1.2 Vendor Data Schedule

Vendor data required by the specification sections are identified on the vendor data schedule. The vendor data schedule provides a tabular listing by item number, specification reference, and description of the item or service. The type of submittal is identified by a “Vendor Data Code,” and the time required to submit the item is identified by a “When to Submit” code. An “Approval” code specifies whether the submittal is for Mandatory Approval or for Information Only. One copy of routine paper or electronic file submittals is required; the vendor data schedule may require additional copies. Electronic file submittals are preferred.

6.1.3 Vendor Data Transmittal and Disposition Form 431.13

All vendor data shall be submitted to the contractor using the Vendor Data Transmittal and Disposition Form. The form provides the subcontractor a method to submit vendor data and provides the contractor a means of dispositioning the submittal. The subcontractor shall list the vendor data schedule item number, a vendor data transmittal tracking number (if applicable), specification number reference, a tag number (if applicable), the submittal status (e.g., Mandatory Approval, Information Only, or Re-submittal), the revision level, and the item description. The description should be complete enough that a person unfamiliar with the project can determine what is included in the submittal.

6.1.4 Disposition by the Contractor

The contractor’s comments and required action by the subcontractor will be indicated by a disposition code on the submittal. The disposition codes will be classed as follows:

- A. **Work May Proceed:** Submittals so noted will generally be classed as data that appear to be satisfactory without corrections.
- B. **Work May Proceed with Comments Incorporated. Revise Affected Sections and Resubmit Entire Submittal:** This category will cover data that, with the correction of comments noted or marked on the submittal, appear to be satisfactory and require no further review by the contractor prior to construction.

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C. **Work May NOT Proceed. Revise and Resubmit:** Submittals so dispositioned will require a corrected re-submittal for one of the following reasons:

- (1) Submittal requires corrections, shown on comments, prior to final review.
- (2) Submittal data are incomplete and require more detailed information prior to the final review.
- (3) Submittal data do not meet subcontract document requirements.

D. **Accepted for Use. Information Only Submittal:** Submittals so dispositioned will generally be classified as Information Only for as-specified material and equipment.

Mandatory Approval-coded vendor data will be reviewed by the contractor and receive an A, B, or C disposition. Information Only submittals without comments will receive a D disposition. The A, B, and C-coded dispositioned submittals will be returned to the subcontractor. The D-dispositioned submittals will not be returned to the subcontractor. The contractor may provide internal review of Information Only submittals. In the event that comments are generated on an Information Only submittal, the submittal may be dispositioned B or C and returned to the subcontractor for appropriate action. Acknowledgment of receipt of dispositioned vendor data by the subcontractor will not be required.

The contractor will return dispositioned submittals with reasonable promptness. The subcontractor shall note that a prompt review is dependent on timely and complete submittals in strict accordance with these instructions.

6.2 Spare Parts and Special Tools List

Not applicable.

6.3 Operations and Maintenance Manuals

Not applicable.

6.4 Software

Not applicable.

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6.5 Drawings

Not applicable.

6.6 Inspection Test Plans/Procedures/Reports

This includes the following:

- **Performance Test Procedures (Subcontractor Preshipment):** Performance test plans, procedures, and reports as outlined in Section 7.4.1 of this specification.
- **Performance Test Reports (Subcontractor Preshipment):** Performance test results and reports as outlined in Section 7.4.2 of this specification.

7. QUALITY ASSURANCE

7.1 Minimum Qualifications of Manufacturer, Supplier, or Personnel

The C.V. shims shall be assembled and installed by a firm that has prior related experience pertaining to instillation of C.V. shims into the backhoe valve body and stabilizer valve body on a 446B backhoe.

7.2 Quality Assurance Program

The manufacturer is responsible for providing materials and workmanship that meet the codes and standards identified in this specification.

7.3 Nondestructive Examination

Not applicable.

7.4 Operational Testing

7.4.1 Performance Test Procedures (Subcontractor Preshipment)

The equipment supplier or subcontractor shall submit to the contractor an “in-shop” testing plan and procedure prior to demonstration of the devise. Demonstration shall be performed at the equipment supplier or subcontractor’s facility. he plan and procedure shall include the date, test conditions, duration of testing, testing sequence, materials used, and methods of performing the tests.

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The subcontractor shall inform the contractor 1 week in advance of performance testing so a contractor representative may be present during the testing process.

Testing acceptance criteria:

- Demonstrate cycle time compliance (provided on Table 1) of boom lift from ground-to-stop
- Demonstrate cycle time compliance (provided on Table 1) of stick full curl from stop-to-stop
- Demonstrate cycle time compliance (provided on Table 1) of boom swing from stop-to-snubber.
- Demonstrate cycle time compliance (provided on Table 1) of bucket uncurl from stop-to-stop

7.4.2 Performance Test Report (Subcontractor Preshipment)

The equipment supplier or subcontractor shall submit to the contractor the “in-shop” testing results following the demonstration.

7.5 Special Processes

Not applicable.

8. PACKAGING AND SHIPPING

8.1 Packing and Packaging

Not applicable.

8.2 Marking and Handling

Not applicable.

8.3 Special Transportation Requirements

Not applicable.

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9. INSTALLATION AND MAINTENANCE

9.1 Installation

The C.V. shims shall be installed into the backhoe stabilizer control valves within the 446B backhoe, used for the OU 7-10 Glovebox Excavator Method Project, at the subcontractor's facility.

9.2 Startup and Calibration

The supplier or subcontractor shall ensure that the C.V. shims provide accurate boom, stick, bucket, and pivot speeds.

9.3 Training

NOTE: *It is anticipated that formal training above the instructions provided with the backhoe will not be required.*

The subcontractor shall initially provide any required training to an INEEL representative who will then provide training to other INEEL personnel, as required.

9.4 Maintenance

Not applicable.

10. MARKING AND IDENTIFICATION

Not applicable.

11. ACCEPTANCE

11.1 Final Acceptance Method

Successful performance of the test results and submittal of all documents listed on the vendor data schedule will constitute acceptance.

11.2 Inspection and Hold Points

Unless otherwise specified by the Purchase Order, the supplier shall notify the contractor at least five working days in advance of the time that the shims will be available for source inspection by the contractor representative. Work cannot proceed without written authorization from the contractor after hold point inspection.

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11.3 INEEL Surveillance and Audits

The authorized contractor representative may perform source inspection or surveillance.

12. ATTACHMENTS

Vendor Data Schedule—Form 431.14

Contractor Drawing 519931

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ATTACHMENT A

431.14
08/01/2001
Rev. 03

Vendor Data Schedule

Project Title OU 7-10 GLOVEBOX EXCAVATOR METHOD PROJECT - BACKHOE
MODIFICAITON - CONTROL VALVE FLOW RESTRICTIONS

Project No. 021052 -
21991

**System Engineer/
Project Manager**

LOPEZ DARYL A

Date: 12-APR-02

Rev: 0

**Vendor Data Coordinator
Address**

STURM BETH L, WCB-3WH502, MS: 3535

Vendor Data Codes				
A. As-Built Drawings B. Assembly Drawings C. Attendance Record D. Blasting Plan E. Catalog Data F. Chem & Physical Analysis G. Concrete Mix Design H. Control System Diagram I. Design Calculations J. Installation Instructions	K. Manufacturers Data Report L. O&M Manual M. Parts List N. Piping Drawing O. Procedure/Instructions P. Pump Head Curves Q. Personnel Qualifications R. Red_line Drawings S. RSMI & Maintenance Log T. Sample (Color, Texture, etc.)	U. Shop Drawings V. Survey Records W. Test Procedure X. Special Processes Y. Operational/CC Testing Z. Test Reports AA. UL/FM Listing AB. Warranty/Guarantee AC. Weld Records AD. Wiring Diagrams	AE. MSDS AF. Hardware Schedule AG. Specification AH. Manufacturing/Inspection/Test Plan AI. Test Certification AJ. Recommended Spares AK. Special Tools List AL. Certificate of Conformance AM. Certificate of Disposal or Destruction AN. Design Verification	AO. Design Qualification Testing AP. Traceability Procedure AQ. Cleaning Procedure AR. Weld Procedure Qualification AS. Welder Performance Personnel Qualifications AT. Non-Destructive Examination Personnel Certifications AU. Inspector Certifications AV. Limited Shelf Life/Operational Data AW. Special Packaging, Shipping, and Rigging Procedure AX. Certificate of Materials to ASME Code AY. Chemical Inventory AZ. Other
When to Submit				
AC - As Completed AT - After Test BC - Before Contract Awarded	BFA - Before Final Acceptance BFR - Before Fabrication Release ROS - Removed Off-Site PDS - Prior to Delivery on site	PTP - Prior to Purchase PS - Prior to Shipment PT - Prior to Test	PTC - Prior to Construction Start PTI - Prior to Installation PTW - Prior to Welding	TS - Time of Shipment WP - With Proposal

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ATTACHMENT A

Item No.	Clause/Article or Drawing/Specification Reference	Description	Vendor Data Code	Extra Copies Required	When to Submit	Approval Code
	7.4.1		W. Test Procedure	4	PT - Prior to Test	Approval Required
	7.4.2		Z. Test Reports	4	AT - After Test	Approval Required

Instructions: 1. Refer to subcontract documents for instructions on submittals.
2. Electronic submittals in lieu of paper documents are acceptable and encouraged.
3. The normal number of copies required is ONE. If more are required, the number will be shown here.
4. THE INEEL WILL SCAN ALL SUBMITTED VENDOR DATA INTO A SYSTEM THAT IS ACCESSIBLE TO ALL INEEL EMPLOYEES UNLESS THE SUPPLIER/SUBCONTRACTOR IDENTIFIES SUBMITTED INFORMATION AS PROPRIETARY.